SECTION 15950

TESTING AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. Scope
1. WORK includes a complete mechanical, fluid and thermal survey to define system needs. Certain minimum air handling and hydronic systems balancing and adjusting provisions are indicated. Provide any additional air handling systems and hydronic systems balancing or adjusting provisions deemed necessary to comply with the CONTRACT DOCUMENTS, at no increase in CONTRACT Sum.

B. Description Definitions
1. The words “air handling systems” for the purposes of the WORK under this SECTION shall mean environmental systems provided as part of the WORK under Division 15 Sections.
2. The word “hydronic” for the purposes of the WORK under this heading shall mean COOLING TOWER WATER and CHILLED WATER systems.

C. Related Work Specified Under Other Sections
1. Division 02 Section “Water Distribution.”
2. Division 15 Section “Aboveground Piping Systems.”
3. Division 15 Section “Pumping Equipment.”
4. Division 15 Section “Atmospheric Cooling Equipment.”
5. Division 15 Section “Air Distribution And Exhaust.”
6. Division 15 Section “Environmental Equipment.”
7. Division 16 Section “Environmental Systems Control.”

1.2 QUALITY ASSURANCE

A. Balancing Agency Qualifications
1. Obtain the service of an agency that performs the type of balancing specified. Prior to commencing work under this SECTION, the testing agency shall have been approved by the OWNER’S REPRESENTATIVE. The agency shall be a member of the Associated Air Balance Council (AABC) or shall be a certified member of the State Chapter of the National Environmental Balancing Bureau (NEBB) and shall submit adequate documentation as to its competence. Affiliation with manufacturers, installing contractors, or engineering firms not normally engaged in or certified in air balancing work will preclude acceptance. The field representative of the balancing agency shall be a person certified by the State Chapters of the AABC or the NEBB where this work is performed. Perform WORK per the standards of the AABC, NEBB or SMACNA where applicable, the requirements of the CONTRACT DOCUMENTS and in the presence of the OWNER’S REPRESENTATIVE.

B. Performance Verification
   1. The OWNER may, as an option, engage the services of a qualified independent testing agency to verify that the fluid distribution systems provided under the CONTRACT have been balanced by the CONTRACTOR to produce the end results required by the CONTRACT DOCUMENTS.
   2. During normal course of construction, provide means integral to systems for balancing and testing including: Fluid control devices; pressure, temperature, flow, power and speed sensing points; means of access to WORK being verified.

1.3 SUBMITTALS

A. Furnish submittals for items that are identified in this SECTION by a different typeface and a bracketed code (e.g., *Item [L]*). Refer to Division 01 Section "Submittals" for definition of codes for types of submittals and the administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this SECTION are specified herein under this Article.

B. *Submittals [T]*: Systems acceptance is predicated upon successful completion of specified WORK, receipt by the OWNER'S REPRESENTATIVE of certified data summarizing the performance of systems within design intent, and approval thereof. Following completion of any corrective work and approval of submitted data, provide bound copies of testing, balancing, and adjusting report. Arrange data by system and identify apparatus and items, utilizing referenced minimum standard forms where possible, and supplementing with reasonable facsimiles where necessary and single line systems diagrams indicating points of adjustment. Report shall be accompanied by two copies of referenced standards used as a basis of testing, balancing and adjusting WORK.

C. Certificates: Provide independent laboratory certification of test apparatus calibration data, dated after date of award of CONTRACT. The OWNER'S REPRESENTATIVE reserves the right to require recalibration of any or all test apparatus components per the frequency recommended by the component manufacturer, or when reasonable doubt of accuracy exists.

D. Guarantee: If the balancing agency selected is a member of the AABC, the Balancing Agency, i.e., the CONTRACTOR shall notify the AABC of the CONTRACT award. Deliver the AABC "NATIONAL PROJECT CERTIFICATIONS GUARANTEE" to the OWNER'S REPRESENTATIVE within 30 days of award.

PART 2 PRODUCTS

2.1 BALANCING, ADJUSTMENT AND ACCEPTANCE CRITERIA

A. Air Handling Systems
   1. Systems volume limits:
      a. Air handler delivery: Plus 10%, minus 0% of design CFM at design temperature.
      b. Terminal device delivery: Plus or minus 10% of design CFM at design temperature.

B. Hydronic Systems
   1. System flow limits:
      a. Pump delivery: Plus 10%, minus 0% of design GPM at design temperature.
      b. Flow station delivery: Plus or minus 10% of design GPM at design temperature.

2.2 TEST APPARATUS

A. Test apparatus: Provide required by SMACNA, “Manual for the Balancing and Adjustment of Environmental Systems”, AABC “National Standards for Field Measurements and Instrumentation”, Volumes, I and II, or NEBB, “Procedural Standards for Testing, Balancing, Adjusting of Environmental Systems”.

PART 3 EXECUTION

3.1 GENERAL

A. Perform tests for structural integrity and leakage prior to balancing, adjusting, insulation of surfaces, painting and concealment of the WORK. Retest systems containing repaired defects to original criteria, except upon waiving of test by the OWNER’S REPRESENTATIVE.

B. Perform hydronic systems structural and leakage testing per requirements specified under Division 15 Sections under PIPING SYSTEMS TESTING in each SECTION.

C. Perform air handling systems structural and leakage testing per requirements specified under Division 15 Section “Air Distribution And Exhaust” under FIELD QUALITY CONTROL.

D. Test fire dampers by applying heat to fusible link to permit operation. Testing shall be done in the presence of the OWNER’S REPRESENTATIVE. Fusible links shall be replaced as part of the WORK under Division 15 Section “Air Distribution And Exhaust.”

E. Adjust items of the various systems for proper operation within framework of design intent, and operating characteristics as published by the equipment manufacturer. The OWNER’S REPRESENTATIVE may require the CONTRACTOR to provide the services of an authorized representative of the manufacturer in the event that the CONTRACTOR is unable to adjust any piece of equipment.

F. Do not operate equipment for any purpose until properly lubricated and brought into specified service condition.

G. Make system final adjustments and permanently mark and fix settings by drilling and bolting or pinning of operators, so as to be readily restorable if disturbed.

H. Where unusual measurement conditions occur, take data and do work in a manner previously agreed upon with the OWNER’S REPRESENTATIVE.

3.2 AIR HANDLING SYSTEMS

A. General
   1. After balance and adjustment operations have been completed, test the system as a whole to see that all items perform as an integral part of the system, and that space conditions are evenly controlled. Make corrections and adjustments necessary to produce the required space conditions.

B. Balancing Procedure
   1. Balance and adjust apparatus per the standards of AABC, NEBB, or SMACNA.

C. Balancing Report
   1. Provide balancing report on systems balanced, balancing test apparatus data, and air diffusion device flow coefficients, using current AABC standard forms for the following:
      a. Air handling apparatus data.
      b. Exhaust fan data.
      c. Air diffusion devices data.
      d. Duct traverse data for the main supply duct, main exhaust duct, outside air intake duct, and ducts indicated.
      e. Duct zone traverse data.
      f. Filter apparatus data which includes visual condition, inlet pressure and differential pressure for each filter installation.
      g. Coil data which includes visual condition, inlet pressure and differential for each coil installation.
      h. Pressure at inlet to each variable volume box.
      i. Air balancing station performance data and curves.

3.3 HYDRONIC SYSTEMS

A. Procedure
   1. Complete air balance shall have been accomplished before water balance begins.
   2. Prepare hydronic systems in the following manner:
      a. Verify that valves and balancing devices are properly installed.
      b. Open valves to full open position, including coil stop valves, by-pass valves and return line balancing cocks.
      c. Remove and clean strainer screens. Refer to Division 15 Section “Aboveground Piping Systems” for pipe flushing procedures.
      d. Examine and determine that water in each system has been treated as specified.
      e. Check rotation of pumps only after obtaining approval from OWNER’S REPRESENTATIVE.
      f. Check compression tanks to determine that they are not air-bound and that system is full of water.
      g. Check air vents at high points and determine that they are installed and operating properly.
      h. Set valves so that all coils are on full cooling flow through coils. Use same procedure when balancing heating coils, set temperature controls on full heating.

i. Set water circulating pumps to proper GPM delivery.
j. Adjust chilled water flow through water chillers.
k. Check entering water temperatures and leaving water temperatures through cooling and water heating equipment.
l. Check water temperature at inlet side of cooling coils. Note rise of temperature from source.
m. Proceed to balance each coil.
n. Upon completion of flow reading and adjustment of coils, mark settings and record data.
o. After adjustment to coils are made, recheck settings at pumps, convertors; readjust if required.
p. Measure pressure drop through coils at set flow rate on call for full cooling and on full heating. Set pressure drop across by-pass valve to match coil full pressure drop to prevent unbalanced flow conditions when coils are on full bypass.

3. Duplicate applicable provisions for each hydronic system.
4. Balance and adjust apparatus per the standards of AABC, NEBB, or SMACNA.

B. Balancing Report
1. Provide operational test on all systems balanced, balancing test apparatus data, orifice or pitot tube data, and include:
a. For each cooling water coil element: Inlet water temperature; leaving water temperature; inlet air relative humidity and air temperature; air pressure drop across each element; water pressure drop across each element; pressure drop across bypass valve; calculated and measured flow rates through all system elements.
b. For each pump: Balanced condition suction and discharge pressure; flow rate; mechanical specifications of unit; rated and actual KW input and power factor.
c. For each hot water convertor equipment item: Inlet water temperature; leaving water temperature; pressure drop across all units; calculated and measured waterflow.

END OF SECTION

Revision History	
Date	**Rev. No.**
B	0
C	0
D	0
E	0
F	0
02-19-09	0

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